

Lower Mississippi River Sub-basin Nutrient Reduction Strategies

Lower Mississippi River Sub-basin Committee on Hypoxia

June 2007

Policy Directive: "... States, Tribes, and Federal agencies within the Mississippi and Atchafalaya River Basin, using available data and tools, local partnerships, and coordination through sub-basin committees... will develop strategies for nutrient reduction. These strategies will include setting reduction targets for nitrogen losses to surface waters, establishing a baseline of existing efforts for nutrient management, identifying opportunities to restore floodplain wetlands (including restoration of river inflows) along and adjacent to the Mississippi River, detailing needs for additional assistance to meet their goals, and promoting additional funding."

- *Action Plan for Reducing, Controlling, and Mitigating Hypoxia in the Northern Gulf of Mexico* (2001).¹

The Lower Mississippi River Sub-basin Committee on Hypoxia (LMRSBC) was formed in 2003 as part of the national Gulf Hypoxia *Action Plan*, which called for the formation of sub-basin committees to coordinate implementation of the Plan by major sub-basins.

The LMRSBC consists of states and agencies serving on the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force. Members are the states of Arkansas, Louisiana, Mississippi, Missouri, and Tennessee, with federal partner agencies (COE, EPA, USDA, USFWS, USGS) serving as ex-officio members, and Agricultural Coalition for the Environment as a supporting member.²

Geographic Area of Focus: While the Lower Mississippi River is generally viewed as the segment of the river south of Cairo, Illinois, a state-based approach to forming the sub-basin committee was adopted for organizational purposes. The LMRSBC chose to focus on the southernmost section of the river for activities and participants, to avoid unnecessary overlap with other Sub-basin Committees, since some states, such as Illinois, Missouri and Tennessee, fall within more than one sub-basin.

The LMR SBC's area of focus has been the Missouri Bootheel and all areas south in the Mississippi River Alluvial Valley, running to the mouth of the river. Major tributaries such as the Arkansas, Red, and White Rivers have received some attention to date in the LMR SBC's activities, but have not been major areas of focus because they were envisioned in the *Action Plan* as eventually having their own Sub-basin Committees.

Sub-basin Characteristics: The Lower Mississippi River Sub-basin includes the sections of the Mississippi River Delta in Arkansas, Louisiana, and Mississippi, as well as the active coastal delta, the Missouri "Bootheel," and Western Tennessee. The LMR Sub-basin, which has been described as temporally dynamic and spatially complex, has some significant differences from other parts of the basin.

With generally low, flat topography, high rainfall, alluvial soils, and high water tables, the LMR Sub-basin has undergone a significant alteration of its biogeochemical and hydrological cycles. The ecology of the region was dramatically changed over the past century, with the conversion of millions of acres of bottomland hardwood forests to agriculture and the completion of the Mississippi River and Tributaries Project³. The MR&T Project includes the levee system, the Old River control structure and the Atchafalaya Basin Floodway, and the resulting coastal effects in Louisiana.

The LMR Sub-basin transitions from a tributary-fed to a distributary system south of the Mississippi River's confluence with the Red River. The last tributary stream enters the Mississippi just north of Baton Rouge, while the Atchafalaya River flows southward from the Mississippi-Red River confluence.

Sub-basin Nutrient Load Contributions: The Lower Mississippi River Sub-basin includes the area known as the Mississippi Embayment, where land use is primarily agricultural and streams often have high turbidities, mixtures of nutrients and pesticides, and degraded riparian habitat.⁴ Subsequent studies have found that the LMR's yields of suspended sediments, total phosphorus, total nitrogen, and silicate are disproportionately high for its area.⁵

Estimates of the nutrient load contributed by the Lower Mississippi River Sub-basin have changed somewhat since the original CENR reports that formed the basis for the *Action Plan*.

The 3rd CENR Report (1999) stated that the Lower Mississippi basin contributed less than 8% of the nitrogen loading in the basin, as did the combined Arkansas, Red, and Ouachita basins, and that the Lower Mississippi and Arkansas basins contributed about 12% of the total phosphorus.⁶

Spatial models developed by the U.S. Geological Survey (USGS)⁷ have given the following figures for the Lower Mississippi River's contribution to nitrogen export from interior watersheds delivered to the Gulf:

Point Sources: 21.2%

Fertilizer use: 12.1%

Livestock wastes: 2.6%

Nonagricultural nonpoint sources: 10.3%

Atmosphere: 8.6%

These models also include the Lower Mississippi River in the areas delivering up to 90% of nitrogen exported from their interior watersheds to the Gulf.⁸

The 2006 *Reassessment of Point Source Nutrient Mass Loadings to the Mississippi River Basin* by U.S. EPA stated that facilities in the Lower Mississippi River contributed 22.3% of the annual point source load in the basin for total nitrogen, and 14.7% of the annual load for total phosphorus.⁹

Basin and Sub-basin Assessments

Several assessment efforts are underway that will provide important information about nutrient loading and removal in the lower river and tributary basins.

The U.S. Department of Agriculture's *Conservation Effects Assessment Project (CEAP)* was launched in 2003 as a multi-agency effort to quantify the environmental benefits of USDA conservation programs used by private landowners (www.nrcs.usda.gov/technical/nri/ceap.)

U.S. EPA and the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force have carried out a *Reassessment of Point Source Nutrient Mass Loadings to the Mississippi River Basin* (November 2006) updating the earlier 1998 Point Source Assessment.¹⁰

Lower river states have signed agreements with U.S. EPA to implement the Great Rivers Study *Environmental Monitoring and Assessment Program (EMAP)* in the Lower Mississippi River to help close data gaps for that section of the river caused by loss of USGS monitoring stations over the last decade (www.epa.gov/emap/greatriver/EMAP-GRELMR.pdf).

The USGS is conducting two studies in the Lower Mississippi River region:

A Lower Mississippi Valley Integrated Landscaping Monitoring & Science Project, intended to provide a comprehensive resource for scientific and ecological information on the natural resources of the LMAV. The project will examine land-use actions, water management, and habitat conservation (www.lmvsci.gov/index.shtm.)

Trends in Nutrient Concentrations & Loads in the South-Central United States, a report compiled by the USGS Louisiana and Mississippi Water Science Centers, is due out in summer 2007.

The Lower Mississippi River Conservation Committee [Lower Mississippi River Aquatic Resource and Water Quality Assessments]

Nutrient Reduction Strategies for the LMR Sub-basin

Key goals: To reduce nutrient inputs and increase and utilize the nutrient uptake capacity of the LMR Sub-basin, and help fulfill the *Action Plan* steps:

- #8 – Clean Water Act permitting authorities within the Mississippi and Atchafalaya River Basin will identify significant point source dischargers of nutrients and take steps to reduce those loadings;
- #9 – States and tribes within the Basin, with support from federal agencies, will increase assistance to landowners for restoring, enhancing, or creating wetlands and vegetative/forested buffers along rivers and streams within priority watersheds;
- #10 – States and tribes within the Basin, with support from federal agencies, will increase assistance to agricultural producers, other

landowners, and businesses for voluntary implementation of best management practices (BMPs) effective in reducing nitrogen loss to waterbodies.

(Actions 8-10 should be consistent with the Sub-basin Strategies formed in Action 6 above.)

Key considerations:

Strategies should be focused on achieving the goals of the Gulf Hypoxia *Action Plan*; therefore, the hydrological connection of areas of activity with the Mississippi and Atchafalaya Rivers and (ultimately) the Gulf is a central consideration.

The Gulf Hypoxia problem can be addressed and benefited by actions taken throughout the Mississippi River Basin, even in areas not responsible for the largest nutrient inputs to the river system.

Actions taken for local reasons unrelated to Gulf Hypoxia – to improve water quality upstream – will deliver benefits downstream as well. If these actions, such as TMDLs, watershed restoration projects, etc., will contribute to the goal of reducing nutrient inputs to the river and Gulf, they should be included in the baseline inventory of activities in the sub-basin.

Nutrient Reduction Strategies for the LMR Sub-basin

The following broad strategy areas encompass the opportunities available in the LMR Sub-basin to reduce nutrient loading and increase uptake. Several of these strategies overlap, such as wetlands restoration, which can take place on the farm level with retirement of marginal lands, be a component of watershed management, or involve particular habitat areas in riparian or coastal areas. At each level, whether an individual farm or a watershed, combinations of strategies will achieve greater results.

The Lower Mississippi Alluvial Valley has been a leader in conservation and restoration efforts, such as the Conservation and Wetlands Reserve Programs. Louisiana, Arkansas, Mississippi, and Missouri are in the top 10 states for enrollments in the Wetlands Reserve Program www.nrcs.usda.gov/programs/wrp/2007WRPKeyPoints.pdf.¹¹ In addition, several projects have been launched at the sub-basin scale, such as the Lower Mississippi Valley Joint Venture (www.lmvjv.org), which focuses on protection and restoration

of avian habitats, and the Lower Mississippi River Conservation Committee (www.lmrcc.org), which focuses on restoration of natural functioning and habitats between the levees. Ducks Unlimited (DU) has one of the largest private conservation, protection, and restoration efforts, involving tens of thousands of acres in the Mississippi Alluvial Valley, working with agencies and landowners. Individual DU projects are listed by state below (www.ducks.org/conservation/initiative21.aspx).

Specific programs and projects incorporating these strategies – agricultural practices, industrial and municipal reductions, watershed and wetland restoration - are listed below for each state.

Agricultural Best Management Practices (BMPs)

Agriculture is the dominant land use in the LMR. Major crops include cotton, rice, and soybeans, though there are indications that an expansion in corn planting is underway.

There have been BMP initiatives undertaken at the sub-basin scale in recent years. The Lower Mississippi Valley Initiative (LMVI) was launched by USDA NRCS and eight state agricultural agencies in 2000 (AR, KY, LA, MO, MS, TN, TX) to promote BMPs in the Farm Bill, in part as a response to the Gulf hypoxia problem.¹²

Differences in soils, climate, hydrology, and other factors across the Mississippi River Basin mean that agricultural practices have to be tailored to regional, state, and/or site-specific requirements. Best management practices geared to the LMR Sub-basin have continued to be developed and refined.¹³ Many of these practices are being promoted by federal and state agencies, extension services, land grant colleges, and producer associations.

Conservation Tillage
Controlled Drainage Management
Cover Crops/Alternative cropping
Fertility/Nutrient Management; Soil Testing
Flooding fields
Precision Agriculture

The *Master Farmer Programs* in Arkansas, Louisiana, Kentucky, and Mississippi help agricultural producers voluntarily address environmental

concerns related to production agriculture, such as nutrient management, in addition to enhancing their production and resource management skills through a voluntary producer certification process.¹⁴

Specific actions:

Survey state policies and practices on fertilizer use recommendations.

Disseminate information from federal and state research efforts on the most effective mix of BMPs, and their best placement in a watershed, from case studies and ongoing programs.

Expand outreach efforts to state agencies and extension offices, producer groups and other stakeholders, to identify opportunities to achieve mutual water quality goals through nutrient reduction and to direct available federal resources to efforts that aid *Action Plan* goals. Geographic areas of focus include the Arkansas, Louisiana, and Mississippi deltas, and the Missouri "Bootheel" regions.

Industrial and Municipal Source Reductions

There are 3 major municipalities on the main channel of the Lower Mississippi River (Memphis, Baton Rouge, and New Orleans), along with a number of smaller cities, and a number of major cities on tributaries, such as Little Rock. These areas contribute nutrient inputs to the river through industrial facilities, urban stormwater systems, and wastewater treatment plants.

The "Industrial Corridor" between Baton Rouge and New Orleans contains the largest concentration of facilities discharging into the river. The Louisiana Department of Environmental Quality has worked with refineries and other facilities to develop techniques for reducing nitrate releases into the river as part of the Environmental Leadership Program and Louisiana Point Source Initiative. Several facilities have developed techniques at little or no cost to achieve these reductions as part of their wastewater cycling process.

Municipal wastewater systems, along with most stormwater systems, are regulated under the Clean Water Act's National Pollutant Discharge Elimination System (NPDES).¹⁵

Specific actions:

Survey municipalities located on the Mississippi River and major tributaries to ascertain the status of their stormwater programs and wastewater systems, and any trends affecting those, such as population growth.

Carry out Phase II of the Louisiana Point Source Initiative and disseminate information on the techniques utilized to reduce nitrate releases to facilities upstream.

Utilize information from steps 1 and 2, along with point source data compiled by EPA, to identify potential opportunities for nutrient trading projects in the LMR Sub-basin.

Watershed Protection and Restoration Along the Mississippi River and Tributaries

Generally, any improvement in the natural functioning of watershed systems will help reduce nutrient loading and improve water quality. Restoration of watershed functions, and riparian and wetland habitats, that aid in-stream and vegetative processing of nutrients are being planned and undertaken by numerous agencies and groups in the LMR Sub-basin.

A listing of the watersheds in the LMR Sub-basin can be found at www.epa.gov/msbasin/subbasins/lower/wq.htm.

Specific Actions:

Identify watershed programs and projects in each LMR state that a) have complimentary goals with the Hypoxia Action Plan, and b) whose effects will contribute to reduction of nutrient loads in the river and alleviation of hypoxia in the Gulf.

Identify opportunities for reconnecting the river to its floodplain in watersheds that could receive periodic diversion or overflow from the Mississippi to aid nutrient filtration/uptake. Examine whether these areas, which could include agricultural and forest lands, could be the site of annual or semi-annual diversions.

Supporting funding programs and projects in areas identified in steps 1 and 2.

Wetland conservation, protection, and restoration efforts in the Mississippi Alluvial Valley and active delta

The Lower Mississippi Alluvial Valley lost over 75% of its bottomland hardwoods by some estimates, and has been losing the coastal wetlands complex located in the active delta and chenier plain in Louisiana.

Numerous programs and projects are working to restore wetlands in the LMR Sub-basin at different scales, from on-farm sites to bottomland hardwoods to coastal marshes. USDA programs such as Conservation Reserve and Wetlands Reserve have enrolled over 500,000 acres in the LMR Sub-basin. The effects of these efforts on water quality are being evaluated by the USDA CEAP Assessment.

While recent studies have found that natural riparian forests have significantly higher denitrification capacity than non-forested wetlands, restored riparian wetlands, and croplands,¹⁶ efforts undertaken in all of these areas can provide beneficial effects for water quality, especially when considered cumulatively.

Ducks Unlimited, the Conservation Fund, the Nature Conservancy, and other private interests have undertaken extensive wetland protection and restoration projects in all the tributary watersheds of the LMR Sub-basin, with further efforts planned.

There are large-scale coastal restoration projects being planned for the active delta and surrounding basins in Louisiana. In addition, there are several studies underway to assess the nutrient uptake potential of the Atchafalaya River Basin, the largest distributary as well as the largest freshwater swamp in the river system.

Specific actions:

Identify wetland conservation, protection, and restoration projects in tributary watersheds that can benefit efforts to alleviate hypoxia by maintaining and increasing the natural buffering capacity of the system; provide support for funding these efforts.

Support increased incentives for CPR, WRP, and related programs that may already target high priority areas in the Lower Mississippi Alluvial Valley.

Allow CRP enrollments on croplands within the levees where the Corps of Engineers has flowage easements.

Identify coastal restoration projects, both planned and currently operating, that can deliver substantial nutrient uptake benefits to the Gulf of Mexico.

Baseline Inventory of Nutrient-Related Activities by State

MISSOURI

The primary area of focus is the southeast Missouri “Bootheel” adjacent to the Mississippi River.

Tributaries of the Mississippi

St. Francis River (Arkansas)

Sub-Tributaries

Black River

Castor River

Agricultural Management Programs

Conservation Security Program

CSP Watersheds 2005

Little River Ditches Watershed (flows into Arkansas)

www.mor.nrcs.usda.gov/programs/CSP/lil_riv_ditches.html

Lower St. Francis Watershed (flows into Arkansas)

www.mo.nrcs.usda.gov/programs/CSP/low_stfran.html

New Madrid-St. Johns Watershed

www.mo.nrcs.usda.gov/programs/CSP/out/mad_stjohn.html

Missouri 319 Program Projects

www.dnr.mo/wpscd/wpcp/nps/319nps-statewide-map.htm

Mississippi Delta Irrigation Water Management Project
www.epa.gov/owow/nps/Section319III/MO.htm

Missouri Corn Online – “Watershed Research, Assessment, & Stewardship Project (WRASP)”, Missouri Corn Growers Association
www.mocorn.org/waterquality.htm

The Cropping Systems and Water Quality Research Unit, located at the University of Missouri in Columbia, is a joint project with USDA Agricultural Research Service (ARS). Research projects on improved watershed management include work on the Goodwater Creek Research Watershed. www.ars.usda.gov/main/site_main.htm. The Unit also participates in the USDA STEWARDS Program - Sustaining the Earth's Watersheds: Agricultural Research Data System – a web-based data system. <http://www.ars.usda.gov/is/AR/archive/aug06/data0806.htm>

The Center for Agricultural, Resource and Environmental Systems (CARES) at the University of Missouri has developed a “Spatial Nutrient Management Planner” to serve as a decision-support tool for nutrient management planning. www.cares.missouri.edu/snmp/

The Missouri Bootheel Partners/Cropland Flooding Program was formed in 1997 by Ducks Unlimited, the Missouri Department of Conservation, USDA NRCS and other groups to encourage post-harvest flooding of farm fields to expand waterfowl winter habitat, with over 18,000 acres enrolled as of 2007. <http://southern.ducks.org/MissouriBootheel.php>

Cities on the Mississippi River

Cape Girardeau
Charleston

TMDLs

Watershed Summaries

Lower St. Francis River Basin

The St. Francis River flows through southeastern Missouri and northeastern Arkansas before joining the Mississippi River. It transitions from a clear

stream in the eastern Ozarks to a slower, more turbid river in the Mississippi River Embayment. The St. Francis River Basin was chosen as a "Showcase Watershed" for the Lower Mississippi River Sub-basin Committee on Hypoxia. 90% of the land in the basin is used for cropland and pasture.

The Lower St. Francis River was selected as a Focus Watershed by the Lower Mississippi River Sub-basin Committee on Hypoxia
(www.epa.gov/gmpo/specialactivities/index.htm)

Wetland and Habitat Protection and Restoration

The Missouri Department of Natural Resources utilized an EPA Wetland Program Development Grant to develop the framework for a state wetland conservation plan, and coordinates wetland protection activities through the Water Resources and Water Pollution Control Programs.

www.epa.gov/owow/wetlands/WPDG_Case_Studies/R7_Missouri.html

The state Wetlands Conservation Plan is administered through the Water Resources Center, assessing Section 404 Wetland Mitigation Sites, and working to locate small headwater wetlands in agricultural areas to improve water quality. www.dnr.mo.gov/env/wrc/wetlands.htm

The Mingo Basin Conservation Opportunity Area, which includes the Mingo National Wildlife Refuge and the Duck Creek Conservation Area, contains the largest tract of bottomland hardwood forest in Missouri.

<http://mdc.mo.gov/conmag/2005/10/40.htm>

The Mingo National Wildlife Refuge, at 21,592 acres, is the largest remnant of the original 2.5 million acres of bottomland hardwood forests in Missouri.

<http://midwest.fws.gov/mingo>

Ducks Unlimited acquired 2,909 acres of bottomland hardwoods and formerly wet prairie along the Mississippi River to form the B.K. Leach Conservation Area. www.ducks.org/Missouri/MissouriProjects/

"Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Missouri" – Summary Map

Lower Mississippi River Conservation Committee

<http://www.lmrcc.org/MRCI.htm>

Resources: Partnerships, Programs, Reports, Research

Bootheel Resource Conservation & Development Council, Inc.
www.morcd.org/bhrdc

Delta Research Center
<http://aes.missouri.edu/delta/index.stm>

Middle Mississippi River Partnership
www.swird.org

Missouri Water Quality Report 2004
Missouri Department of Natural Resources, Water Protection Program
http://www.dnr.mo.gov/env/wpp/waterquality/305b/2004_305b.pdf

ARKANSAS

Areas of focus are the Delta eco-region of Arkansas and the Lower Ouachita River Basin.

Tributaries

St. Francis River
White River
Arkansas River

Sub-Tributaries

L'Anguille River
Cache River
Ouachita River

Agricultural Management Programs

The Arkansas Cooperative Extension Service has published guides on Environmental Management and Soil and Water Management geared to the Delta Eco-Region, "Protecting Soil and Water Resources in the Delta,"
http://www.arnatural.org/environmental_management.htm;
www.aragriculture.org/soil_water/soil_water_delta/default.htm

The Arkansas Partners Program initiated by Ducks Unlimited, USDA NRCS and other agencies utilizes winter flooding of agricultural fields for waterfowl habitat, which also benefits water quality.

www.ducks.org/Arkansas/ArkansasconservationProject.htm

Conservation Security Program 2007 – Upper White-Village Watershed

Conservation Security Program 2006

Lower Arkansas Watershed – 94 CSP contracts approved

Conservation Security Program 2005

Lower St. Francis Watershed – 336 CSP contracts approved

Lower White/Bayou Des Arc Watershed – 131 CSP contracts approved

Little River Ditches – 105 CSP contracts approved

www.ar.nrcs.usda.gov/programs/csp.html

319 Programs

Buffalo National River Watershed Partnerships: Swine Waste Management

www.epa.gov/nps/Section319III/AR.htm

Cadron Creek Dairies – Animal Waste Management

Muddy Fork Hydrologic Unit Area: Beatty Branch/Moore's Creek –

Confined Animal Feeding Operations

www.epa.gov/owow/nps/Section319II/AR.html

The International Plant Nutrient Institute (formerly Potash & Phosphate Institute) has published “Fertilizer BMPs for Cotton in the MidSouth”.

<http://www.ipni.net/cottonfertilizerbmp>

A Conservation Tillage Conference held in January 2005 included several presentations focused on cotton production in Arkansas.

www.cottoninc.com/engineering/conservationtillageconference/2005/Pg=4

Cities on the Mississippi River

West Memphis

West Helena

Helena

Cities on Tributaries

Little Rock

TMDLs

Stone Dam Creek Watershed (Arkansas River Valley) – Amonia and Nitrate
November 2003

www.epa.gov/water/tmdl/docs/StoneDamCreekFinalTMDLs.pdf

Sections of the Mississippi River have been included on the state's 303(d) list (http://iaspub.epa.gov/tmdl/huc_rept.control/LowerMississippi.htm).

Arkansas TMDL Documents

www.epa.gov/region6/water/artmdl.htm

Watershed Summaries

Bayou Bartholomew

Bayou Bartholomew has been called the nation's longest bayou, and is one of the last major streams in the LMAV that has not been dredged or channelized. It flows into the Ouachita River in northeast Louisiana, and is thus connected to the Gulf of Mexico through the Atchafalafaya River.

A number of local, state, and federal projects are underway in the Bayou Bartholomew watershed to protect and restore habitat and improve water quality.

The Bayou Bartholomew Alliance was formed in 1995, and the Bayou Bartholomew Foundation in 2005. <http://www.arkansas.gov/bba/>;
<http://www.arkansas.gov/bba/foundation.htm>.

The Alliance and partners received an EPA Targeted Watershed Grant in 2003 to address impairments and habitat loss in the watershed.
<http://www.epa.gov/owow/watershed/initiative/2003/summaries/bayou.pdf>

The newsletter "On the Bayou" identified BMPs and conservation programs for landowners and stakeholders that can improve the watershed's health.

www.aragriculture.org/soil_water/soil_water_delta/OnBayou/on_bayou_99.htm.

Bayou Bartholomew was selected as a Focus Watershed by the Lower Mississippi River Sub-basin Committee.

(www.epa.gov/gmpo/specialactivities/index.htm)

Fourche Creek Watershed

The Fourche Creek Watershed drains and filters over 90% of the Little Rock metropolitan area, which includes stormwater and other non-point source runoff, and eventually flows into the Arkansas River. The watershed is also impacted by nutrients from agricultural and domestic faces challenges from floodplain development and sedimentation. An EPA Targeted Watershed grant was awarded in 2004 to address these challenges.

<http://www.epa.gov/twg/2005annualreport/2004fourche.pdf>

Audubon Arkansas and other partners collaborated on the Fourche Creek Watershed Initiative with funding from EPA.

<http://www.epa.gov/twg/2004/2004proposals/04fourhecreek.pdf>

White River Watershed

The White River flows from northwest Arkansas into Missouri and enters Arkansas to join the Mississippi River. The lower White River basin has been described as one of the most important bottomland hardwood wetlands in the world, and includes the Cache River, which joins the White before it empties into the Mississippi.

A major ecosystem study of the White River Basin has been undertaken by EPA – “An Ecological and Habitat Vulnerability Assessment of Arkansas’ White River Basin” (2002). This study included habitat and water quality vulnerability assessments, and their relation to landscape change. Loss of riparian vegetation was cited as a potential factor contributing to the overall load of nutrients being delivered to the Mississippi River and Gulf of Mexico. <http://www.epa.gov/esd/land-sci/whiteriver.htm>

[A Landscape Atlas of Ecological Vulnerability: Arkansas' White River Watershed and the Mississippi Alluvial Valley Ecoregion](http://www.epa.gov/esd/land-sci/pdf/EPA600R03057_Aug03.pdf) was completed in 2003 (http://www.epa.gov/esd/land-sci/pdf/EPA600R03057_Aug03.pdf).

The White River flows 90 miles through White River National Wildlife Refuge, with many streams, bayous, and sloughs across the refuge flowing into the river (<http://www.fws.gov/whiteriver/habitatpage.htm>.)

The Raft Creek Bottoms along the White River were once extensive bottomland hardwood forests, which were converted to cropland in the 1960s-1970s. Under the WRP program, most of the tract has been reforested, with extensive restoration of waterfowl habitat.
www.nrcs.gov/programs/wrp/states/success_ar.html

Cache River

The Cache River, together with White River, has been called the largest remaining tract of contiguous bottomland hardwood forest in North America. Recent sightings of the Ivory-billed woodpecker have expanded protection efforts in those watersheds.

Cache River National Wildlife Refuge www.fws.gov/cacheriver

Cache River Natural Area, Rex Hancock/Black Swamp Wildlife Management Area. www.agfc.com/data-facts-maps/maps/wildlife-mgt-areas/rex-hancock-black-swamp.aspx

Wetland and Habitat Protection and Restoration

The Arkansas Wetland Conservation Plan is a multi-agency effort that identifies priority areas for restoration and protection, ranking them within a watershed. Lands close to existing waterways, riparian corridors, and fragmented forest areas are high priorities. Regional reports have been done for several watersheds in the Delta eco-region – Bayou Meto, Bayou Bartholomew, and the St. Francis River
www.mawpt.org/plan/area_reports.asp

Arkansas Wetlands Reserve Program
www.nrcs.usda.gov/programs/wrp/states/ar.html

Ducks Unlimited has worked with private and public partners to create and restore over 300,000 acres of waterfowl habitat in Arkansas, including projects on the White River and Overflow National Wildlife Refuges, and the Raft Creek, St. Francis Sunken Lands, Seven Devils Swamp, and Bayou Meto Wildlife Management Areas.

www.ducks.org/Arkansas/ArkansasConservation/1286/WetlandsReserveProgramArkansas.html

The Nature Conservancy has preserved 300 acres along Benson Creek, located on the western edge of Bayou DeView. The tract consists of previously cleared terraces dropping into bottomlands and swamps, and adjoins over 4000 acres of the Cache River National Wildlife Refuge.
www.nature.org/wherewework/northamerica/states/arkansas/preserves/

The “Big Woods” Conservation Partnership undertaken by the Nature Conservancy and other agencies and groups to protect habitat for the ivory-billed woodpecker will preserve one of the largest blocks of bottomland hardwood forests in the U.S., located in the Cache and White River basins.
www.ivorybill.org/factsheet_TNCBigWoods.html

“Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Arkansas” – Summary Map
Lower Mississippi River Conservation Committee
<http://www.lmrcc.org/MRCI.htm>

American Land Conservancy purchased Buck Island in the Mississippi River near the mouth of the St. Francis River.
www.alcnet.org/projects/overview/Mississippi/buck

Resources: Patnerships, Programs, Reports, Research

Arkansas Watershed Advisory Group
www.awag.org/watershed_groups_p1.html

Arkansas Stream Team
<http://www.agfc.com/fishing/special-programs-fish/stream-team.html>

TENNESSEE

The area of focus is the Mississippi Alluvial Valley in Western Tennessee.

Tributaries

Obion River
Forked Deer River

Hatchie River
Loosahatchie River
Wolf River
Nonconnah Creek

Agricultural Management Programs

The Tennessee Partners Project, a cooperative effort between Ducks Unlimited, NRCS, TWRA, TN Department of Agriculture, and University of TN Extension, helps landowners create waterfowl impoundments for winter flooding of fields. <http://southern.ducks.org/TNPartners2005.php>

Cities on the Mississippi River

Arlington – Wastewater Treatment
<http://www.townofarlington.org/services.php>

Memphis

City of Memphis/Shelby County Governments Official Stormwater Matters
Website: www.stormwatermatters.com/Home/

The Memphis Metro Area Steering Committee is working with the U.S. Army Corps of Engineers to address storm water issues as part of the "Memphis Metropolitan Area Storm Water Management" project
www.mvn.usace.army.mil/projects/pdf/tennessee.pdf.

Tiptonville

Wastewater Treatment
<http://www.tiptonville.org/departments.html>

EPA-Approved TMDLs on tributaries

Obion River – E. Coli – 2002
South Fork, Obion River – E. Coli - 2007
North Forked Deer River – fecal coliform – 2002; E. Coli – 2006
Loosahatchie River – fecal coliform – 2001
Wolf River – fecal coliform – 2003
Nonconnah Creek – fecal coliform - 2001

TMDLs are listed at www.state.tn.us/environment/wpc/tmdl.php

Watershed Summaries

In 1996, the Tennessee Department of Environment and Conservation Division of Water Pollution Control adopted a watershed approach to water quality, focusing on the whole watershed to support efforts to control point and non-point sources of pollution. Water quality management plans have been developed for a number of watersheds of tributaries to the Mississippi River in western Tennessee.

Obion River

The Obion is the primary surface water drainage system of northwest Tennessee. After extensive channelization in the mid-20th century, efforts have begun to restore habitat and natural functioning for some sections of the river. The U.S. Corps of Engineers has two projects involving restoration the Obion River watershed, the “Lower Obion River and Vicinity” Study and the West Tennessee Tributaries Project, at different stages of progress. www.mvn.usace.army.mil/projects/pdf/tennessee.pdf

The Nature Conservancy announced in March 2007 a donation of 30 acres of wetlands adjacent to the Jarrell Switch Refuge, a 250 acre wetland area regularly flooded by the South Fork of the Obion River, managed by TWRA (www.nature.org/wherewework/northamerica/states/tennessee/press/).

Ducks Unlimited created a wetlands enhancement project for winter flooding of fields on the Bogota Wildlife Management Area, adjacent to the Obion River in Dyer County. <http://southern.ducks.org/BogotaWMA.php>

Forked Deer River Watershed

A Water Quality Management Plan was presented in 2003. www.state.tn.us/environment/wpc/watershed/wsmplans/forkeddeer/

The 1998 303(d) list did not indicate that excessive nutrients and/or low dissolved oxygen depletion were a problem in the watershed. The Water Quality Management Plan recommended the following voluntary activities: encouraging no-till farming, proper fertilizer rates for crops and soils, proper

application of lawn fertilizers, retention of stream buffer zones, use of grassed drainage ways, and use of native plants for landscaping, which require less fertilizer and water.

The North and South Forked Deer Rivers are included in the USACE's West Tennessee Tributaries Project cited above.

Hatchie River Watershed

The mainstem Hatchie is the last unchannelized river of its type in the lower Mississippi Valley, and the longest free-flowing tributary of the lower Mississippi River. Natural flood processes sustain a number of native habitats, but sedimentation, contaminants, altered flow patterns, and habitat fragmentation in the Hatchie's tributaries also threaten the health of the watershed.

The Hatchie River Project's first restoration effort on Richland Creek, while aimed at reducing erosion, will also improve water quality on a tributary stream (www.hatchie.com/richland_creek_restoration_proje.htm).

The Nature Conservancy has created a five-year plan to reduce sediment flows to the river and protect bottomland hardwood forest habitat as part of its Hatchie River Project, working with U.S. Fish & Wildlife Service (www.nature.org/wherewework/northamerica/states/tennessee/).

The Lower Mississippi River Conservation Committee has proposed acquiring lands around the mouth of the Hatchie River in the active floodplain (<http://www.lmrcc.org/MRCI.htm>).

Ducks Unlimited and the U.S. Fish & Wildlife Service have utilized water control structures to enhance moist-soil habitat and flood agricultural crops to provide waterfowl wintering areas on the Lower Hatchie National Wildlife Refuge (<http://southern.ducks.org/LowerHatchieNWR.php>).

The Dry Creek watershed in the Hatchie River Basin was selected as a Focus Watershed by the Lower Mississippi River Sub-basin Committee on Hypoxia (www.epa.gov/gmpo/specialactivities/index.htm)

Loosahatchie River Watershed

A Water Quality Management Plan was presented for the watershed in 2003. (www.state.tn.us/environment/wpc/watershed/wsmplans/loosahatchie/).

The watershed includes agricultural and urban areas, with 16 NPDES-permitted facilities, 8 of which discharge into streams listed on the 1998 303(d) list. The Water Quality Management Plan includes USDA-NRCS data on conservation practices in the watershed from the Performance & Results Measurement System (<http://prms.nrcs.usda.gov/prms>), and a map of BMPs installed from 1999-2002 through the TN Department of Agriculture's non-point source and conservation fund grant programs.

The U.S. Army Corps of Engineers' "Millington and Vicinity" Project involves the Big Creek drainage basin, a tributary of the Loosahatchie (www.mvn.usace.army.mil/projects/pdf/tennessee.pdf).

An innovative project was launched in 2004 by six smaller municipalities in the watershed whose growth had prompted construction of new wastewater treatment plants, working in conjunction with the University of Memphis and other partners to reduce dissolved oxygen and nutrient impacts (www.tetratex-ffx.com/lower_miss/pdf/thursday/moore.pdf).

Wolf River

The Wolf River enters the Mississippi just north of downtown Memphis, and drains a mixed rural/urban watershed, with extensive protection and restoration efforts as well as major growth challenges occurring.

The Wolf River Watershed has received a Water Quality Management Plan (www.state.tn.us/environmental/wpc/watershed/wsmplans/wolf/).

The Ghost River Land Acquisition Project involves protection and restoration of a section of the Wolf River drainage, undertaken through the 319 Program (www.epa.gov/owow/nps/Section319III/TN.htm).

The Nature Conservancy's William B. Clark Conservation Area preserves 500 acres of bottomland hardwood forest in the Wolf River floodplain (www.nature.org/wherewework/northamerica/states/tennessee/).

The Wolf River Conservancy has succeeded in getting a Greenways Plan for the watershed passed in Memphis/Shelby County. www.wolfriver.org

Nonconnah Creek

Nonconnah Creek received a Water Quality Management Plan in April 2002 (<http://state.tn.us/environment/wpc/watershed/wsmplans/nonconnah/>)

Wetland and Habitat Protection and Restoration

The Tennessee Wildlife Resources Agency (TWRA) has identified extensive "areas of conservation interest" in West Tennessee, including sections of the Hatchie River, the Lower and Upper Obion River, the Middle and South Forks of the Forked Deer River, and the Wolf River, as well as the Mid-Mississippi Alluvial Valley and Eagle Lake Refuge, both areas north of Memphis (www.state.tn.us/twra/thcp/west%20tenn%2011-20-06.pdf).

Ducks Unlimited has projects on federal and state refuges and management areas located in the Mississippi Alluvial Valley in Tennessee: Chickasaw and Lower Hatchie National Wildlife Refuges, Eagle Lake and White Lake Refuges, and the Bogota and Ernest Rice Wildlife Management Areas (www.southern.ducks.org/Tennessee/TennesseeProjects/). DU's Eagle Lake Refuge Project involves restoration of over 1000 acres of wetlands, along with flooded agricultural fields, adjacent to the Mississippi River north of Memphis (www.southern.ducks.org/EagleLakeRefuge.php).

In discussions about the LMRCC's Lower Mississippi River Conservation Initiative held at the Tennessee Wildlife Resources Agency in 2001, several opportunities to reconnect the river to its floodplain were recognized, including Open Lake in the Lower Forked Deer River watershed, where water quality would also be benefitted (www.lmrcc.org/TNmtpdf.pdf).

"Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Tennessee" – Summary Map
Lower Mississippi River Conservation Committee
<http://www.lmrcc.org/MRCI.htm>

"Tennessee's Wetland Conservation Strategy;" "An Assessment of Wetland Mitigation in Tennessee," www.state.tn.us/environment/wetlands/

Resources: Partnerships, Programs, Reports, Research

Tennessee Department of Agriculture Water Resources Program
<http://state.tn.us/agriculture/nps/index.html>

Tennessee Heritage Conservation Trust Fund
<http://state.tn.us/twra/tchp.html>

Tennessee Water Sentinels
Memphis, TN
<http://www.sierraclub.org/watersentinels/tennessee/>

Tennessee Watershed Management Groups
www.state.tn.us/environment/wpc/watershed/

West Tennessee River Basin Authority
www.state.tn.us/environment/boards/wtn_river_board.shtml

2006 305(b) Report: Status of Water Quality in Tennessee
Tennessee Department of Environment & Conservation (TDEC)
Division of Water Pollution Control
www.state.tn.us/environment/wpc/publications/2006305b.pdf

*Tennessee Rivers Assessment Project – Summary Report – 1998
Mississippi River*; TDEC, Division of Water Pollution Control
www.state.tn.us/environment/wpc/publications/riv/misisipi.shtml

“Regional Characterization of Streams in Tennessee with Emphasis on
Diurnal Dissolved Oxygen, Nutrients, Habitat, Geomorphology and
Macroinvertebrates,” TDEC, Division of Water Pollution Control

USDA Agricultural Conservation and Management Programs in Tennessee:
Tennessee Wetlands Reserve Program

www.tn.nrcs.usda.gov/programs/WRP/wrp-index.html

Tennessee EQIP

www.tn.nrcs.usda.gov/programs/eqip2007/index.html

EQIP Riparian Forest Buffer Incentive

www.tn.nrcs.usda.gov/programs/eqip2007/riparian_for_buff.html

Comprehensive Nutrient Management Plan Initiative 2007

www.tn.nrcs.usda.gov/programs/CNMP/CNMP-index.html

U.S. Geological Survey Publications:

“Effects of Agricultural Practices on Water Quality in West Tennessee”
Tennessee State Fact Sheet; <http://pubs.usgs.gov/fs/FS-042-96/>

“Nutrient, sediment, and pesticide data collected at four small agricultural basins in the Beaver Creek Watershed, West Tennessee, 1990-1995”,
S. Williams, R. Harris; USGS Open File Report 96-366
<http://pubs.usgs.gov/of/1996/ofr96-366/>

“Shoals and Valley Plugs in the Hatchie River Watershed”, T.H. Diehl,
Water-Resources Investigations Report 00-4279
<http://pubs.usgs.gov/wri/wri004279/>

MISSISSIPPI

The area of focus is the Mississippi Delta and the Southern Independent Streams that drain into the Mississippi River.

Tributaries

Yazoo River
Big Black River
Bayou Pierre
Homochitto River
St. Catherine's Creek

Cities On the Mississippi

Tunica
Greenville
Vicksburg
Natchez

City of Vicksburg Public Works – Waste Water Treatment
<http://web.vicksburg.org/Vicksburg/>

Agricultural Management Programs

Animal Waste Irrigation 319 Project

www.epa.gov/owow/NPS/Section319II/MS.html

Conservation Security Program (CSP) – Lower Big Black River Watershed (2005); www.ms.nrcs.usda.gov/programs/MS/

Thirty-two CSP applications have been approved in the Lower Big Black River Watershed.

Delta Farmers Advocating Resource Management

www.deltafarm.net

Mississippi 319 Projects

<http://www.mswcc.state.ms.us/wqproj.html>

TMDLs and Impaired Waters

Bayou Pierre – Fecal Coliform – 1999

Office of Pollution Control, Mississippi Department of Environmental Quality; www.epa.gov/water/tmdl/docs/67.pdf

Big Black River – Fecal Coliform - 2000

deq.state.ms.us/mdeq.nsf/pdf/TWB_BigBlackRiverseg1fecalcoliform/

Big Black River – Nutrients and Organic Enrichment/Low Dissolved Oxygen – Betsy Creek – October 2006

Big Black River – Sediment – Proposed December 2006

Yazoo River and tributaries

http://www.deq.state.ms.us/MDEQ.nsf/page/TWB_yazoostatrep/

Mississippi Department of Environmental Quality TMDL Program

http://www.deq.state.ms.us/MDEQ.nsf/page/TWB_Total_Maximum_Daily_Load_Section?OpenDocument

Lower Mississippi River – Natchez – 303(d) List Fact Sheet

http://iaspub.epa.gov/tmdl/huc_rept.control?p_huc=08060100

Homochitto River Watershed – 303(d) List Fact Sheet

http://iaspub.epa.gov/tmdl/huc_rept.control?p_huc=08060205

Watershed Summaries

Yazoo River Basin

The Yazoo River Basin is the largest in Mississippi, and drains one of the most intensively farmed parts of the Mississippi River Alluvial Plain. The Yazoo River, which enters the Mississippi north of Vicksburg, is fed by numerous streams in the Bluff Hills and Delta portions of the basin, and its flow is divided by four large flood control reservoirs. The Yazoo Basin is largely separated from the Mississippi River by an extensive levee system that runs the entire length of the western side of the basin. The northwestern part of the basin is experiencing sub-urban expansion from Memphis and growth from the casino industry along the Mississippi River.

The Yazoo River drainage area accounts for about 1.7% of the Mississippi River's drainage, and on average about 2.8% of the Mississippi's flow. Backflow from the Mississippi River is a major influence on the Yazoo's discharge and functioning. Measured nutrient loadings show the Yazoo River accounts for 1.4% of the total nitrogen, 0.7% of the nitrate, 3.4% of the total phosphorus, and 1.6% of the orthophosphorus delivered to the Mississippi River.

http://www.tetrattech-ffx.com/lower_miss/pdf/thursday/coupe.pdf

The Yazoo Mississippi Delta Joint Water Management District (YMD), a multi-county water resource agency is involved with a number of projects and collaborative efforts, including periodic conferences that summarize conservation and water quality projects (www.ymd.org).

The "Lower Yazoo River Basin Economic and Environmental Restoration Initiative" proposed a strategy that includes water and sewer infrastructure and floodplain restoration, explicitly mentioning the goal of improving water quality locally and downstream in the Gulf of Mexico. The plan also calls for conservation easements on the most frequently-flooded lands through the NRCS Emergency Wetland Reserve Program and Section 319 of the Clean Water Act.

www.epa.gov/region04/water/specialprojects/yazoo/investment.htm

A Hydrologic Observatory has been proposed for the Yazoo River Basin that would study erosion, nutrient transport, and other processes.

www.olemiss.edu/sciencenet/Yazoo/poster/

Big Black River Basin

The Big Black River enters the Mississippi River 25 miles south of Vicksburg. It is one of the last undammed rivers east of the Mississippi, and most of its tributaries are undeveloped. It is affected by backflow from the Mississippi under high water conditions.

Agriculture and forest are the largest land use types. Sections of the Big Black River and its tributaries are impaired by nutrients and sediments.
www.deq.state.ms.us/mdeq.nsf/page/WMB_Big_Black_River_Basin

Bayou Pierre

EPA Watershed Profile
http://cfpub.epa.gov/surf/huc.cfm/huc_code=0800203

Homochitto River

The Homochitto River flows through the Homochitto National Forest and enters the Mississippi River through two channels, one about 17 miles south-southwest of Natchez, and the other 25 miles south-southwest of Natchez, through Old River Lake.

Homochitto National Forest: www.fs.fed.us/r8/mississippi/homochitto

St. Catherine Creek

St. Catherine Creek flows into the Mississippi River south of Natchez. The St. Catherine National Wildlife Refuge borders the Mississippi River's eastern side, with the Homochitto River forming a southern boundary. The Refuge encompasses nearly 26,000 acres, with over 11,000 acres of reforested agricultural land.
www.fws.gov/saintcatherinecreek/

Wetland and Habitat Protection and Restoration

The Delta National Forest contains over 60,000 acres of bottomland hardwood forests, seasonally flooded areas, and small sloughs draining into the Big and Little Sunflower Rivers in the Yazoo Basin.
www.fs.fed.us/r8/mississippi/delta

Ducks Unlimited has projects providing winter waterfowl habitat and restoring wetlands on federal and state refuges and management areas, as well as the Delta National Forest (www.ducks.org/Page1666.aspx)

DU is also a major participant in the Wetlands Reserve Program in Mississippi, with restoration of bottomland hardwood forests in the Delta a major focus.

(www.ducks.org/Mississippi/MississippiConservation/1455/WetlandsReserveProgramMississippi.htm)

“Present and Proposed Conservation Efforts in the Active Floodplain of the Lower Mississippi River: Mississippi” – Summary Map
Lower Mississippi River Conservation Committee
<http://www.lmrcc.org/MRCI.htm>

Resources: Partnerships, Programs, Reports, Research

Delta Land Trust
www.deltalandtrust.org

Lower Delta Partnership
<http://www.fws.gov/southeast/grants/LDP-9-02.pdf>

Lower Mississippi Valley Natural Resources Partnership
www.nbc.gov/accomplishments/printacc.cfm?states=MS

Mississippi Land Trust
www.misslandtust.org

Mississippi River Trust
www.mississippirivertrust.org

Mississippi Soil and Water Conservation Commission
<http://www.mswcc.state.ms.us/wqproj.html>

Mississippi Water Resources Research Institute
<http://www.wrri.msstate.edu/>

Southern Forested Wetlands Initiative, US Department of the Interior
www.nbc.gov/accomplishments/printacc.cfm?states=MS

South Independent Streams Basin Status Report 2000
www.deq.state.ms.us/MDEQ.nsf/pdf/WMB_sindistatrep/

State of Mississippi Water Quality Assessment 2004 Section 305(b) Report Addendum, May 2004
[http://www.deq.state.ms.us/MDEQ.nsf/pdf/FS_305b_2004_Pearl_SI/\\$File/305b_2004_Pearl_SI.pdf?OpenElement](http://www.deq.state.ms.us/MDEQ.nsf/pdf/FS_305b_2004_Pearl_SI/$File/305b_2004_Pearl_SI.pdf?OpenElement)

USDA Agricultural Research Service, National Sedimentation Laboratory
http://www.ars.usda.gov/main/site_main.htm?modecode=64-08-05-00

“Comprehensive Stream-Riparian Corridor Model to Study Impact of Riparian Buffers on Channel and Edge-of-Field processes,” Langendoen, et.al, USDA ARS, 2005
www.ars.usda.gov/research/publications/publications.htm

“Conserving Mississippi’s Freshwater Biodiversity,” Matthew B. Hicks, The Nature Conservancy, www.eco360.com/report/htm

“Duplicity of Wetland Plants in Nutrient Flux within Agricultural Drainage Ditches in Mississippi,” R. Kroger, et.al, USDA Agricultural Research Service, 2005; www.ars.usda.gov/research/publications/publications.htm

“Goodwin Creek Experimental Watershed – Assessment of Conservation and Environmental Effects” Kuhnle, et.al, USDA ARS, July 2005; www.ars.usda.gov/research/publications/publications.htm

“Monitoring and Research Activities in the Goodwin Creek Experimental Watershed,” USDA Agricultural Research Service, <http://ars.usda.gov/Business/docs.htm>

“Nutrient Through-Flow, Deposition, and Assimilation in Agricultural Drainage Ditches,” ARS Publications, November 2005
www.ars.usda.gov/research/publications/publications.htm

Streamflow and Water-Quality Sampling Network for the Mississippi Delta Management Systems Evaluation Areas Project, US Geological Survey

<http://ms.water.usgs.gov/projects/MSEA/index.html>

“Watershed Management Systems for Improved Water Quality in the Mississippi Delta”, Locke, et.al, USDA ARS, 2005-2007
<http://cris.csrees.usda.gov/cgi-bin/starfinder/>

USGS Reports and Studies:

Bogue Phalia Watershed – National Water Quality Study
Fact Sheet 2005-3050

<http://pubs.usgs.gov/fs/2005/3050/>

“Streamflow and Nutrient Data for the Yazoo River Below Steele Bayou near Long Lake, Mississippi, 1996-2000,” M.S. Runner, et.al, September 2002, USGS, Water-Resources Investigations Report 02-4215.

<http://water.usgs.gov/nawqa/>

LOUISIANA

Areas of focus are the Mississippi and Atchafalaya Rivers and their drainage and tributary basins, the industrial corridor and municipalities on the Mississippi and Atchafalaya Rivers, the Ouachita River Basin, and the Vermillion/Mermentau River Watersheds.

Tributaries

Tunica Bayou
Bayou Sara
Thompson Creek
Monsanto Bayou

Sub-Tributaries

Tensas River
Ouachita River
Black River

Distributaries

Atchafalaya River
Bayou Lafourche (limited flow)

Bayou Manchac (closed)
Blind River (closed)

Agricultural Management Programs

Conservation Security Program
CSP Watershed 2006
Tensas River Watershed
www.la.nrcs.usda.gov/programs/csp.html

319 Program Projects
Bayou Queue de Tortue Watershed – BMPs and Pollution Prevention
Bayou Plaquemine Brule – Watershed Planning and Management
www.epa.gov/owow/nps/Section319II/LA.html

Coulee Baton Microwatershed Plan
www.la.nrcs.usda.gov/final

Conservation of Louisiana Private Lands 2007
Louisiana Natural Resources Conservation Service (USDA)
www.la.nrcs.gov/

Cities on the River

Lake Providence
Ferriday
Vidalia
Baton Rouge
Port Allen
Plaquemine
Donaldsonville
Kenner
Metairie
New Orleans
Belle Chasse

Baton Rouge Sewer Wastewater Improvement Program
<http://brsewer.com/WIP/sec2present.asp>

New Orleans Sewerage & Water Board
Water Quality Report 2004
www.swbno.org/documents/wqrpt2005pg7.html

NOWSB: "S&WB Critical Challenges Post-Katrina"
www.swbno.org/030107criticalchallengespr.html

Orleans Parish Wastewater Assimilation Project
www.tetrattech-ffx.com/lower_miss/agenda.htm

TMDLs and Impaired Waters

Black River – DO and Nutrients – May 2002
www.epa.gov/region6/water/ecopro/latmd/blackdo.pdf

Ouachita River – Nutrients, Oxygen – July 2002
Lake St. Joseph – DO and Nutrients – May 2002
[http://www.epa.gov/waters/tmdl/docs/StJosephDO\(f\).pdf](http://www.epa.gov/waters/tmdl/docs/StJosephDO(f).pdf)

2004 303(d) List of Impaired Waterbodies
Atchafalaya River – Simmesport-Whiskey Bay – DO
West Atchafalaya Floodway – Simmesport-Butte la Rose – DO
East Atchafalaya Bay and Morganza Floodway – DO
Bayou Sara – fecal coliform
Devil's Swamp-Bayou Baton Rouge – Nitrate/Nitrite, DO, fecal coliform,
total phosphorus, turbidity
Bayou Lafourche-Donaldsonville – Nutrients, DO, fecal coliform
Mississippi River Passes – total fecal coliform
www.deq.louisiana.gov/portal/tabid/130/default.aspx

Bayou Sara-Thompson Creek – Section 303(d) List Fact Sheet
http://iaspub.epa.gov/tmdl/huc_rept.control?p_huc=08070201

Lower Mississippi River – Baton Rouge – Section 303(d) List Fact Sheet
http://iaspub.epa.gov/tmdl/huc_rept.control?p_huc=08070100

Tensas River – 303(d) List Fact Sheet
http://iaspub.epa.gov/tmdl/huc_rept.control?p_huc+08050003

Atchafalaya River Basin 1996 305(b) Appendix A:
Water Body-Specific Information
www.deq.louisiana.gov/static/305b/1996/305b-a01.htm

Mississippi River – 305(b)
www.deq.louisiana.gov/static/305b/1996/305b-a07.htm

Watershed Summaries

Bayou Lafourche

Bayou Lafourche is a former distributary (the “left fork”) of the Mississippi River, closed off in 1904. A plan to reintroduce a portion of river flow back into the bayou, which flows to the Gulf, has been in development since 1996. www.bayoulafourche.org

Ouachita-Black Rivers

The Ouachita River begins in Arkansas’ Ouachita Mountains, and flows into Louisiana south of the Lake Jake Lee Reservoir. It collects the tributary waters of Bayou Bartholomew and a series of bayous and rivers – Bayou de Loutre, Bayou D’Arbonne, the Boeuf River, the Little River, and the Tensas River. South of the Tensas, the Ouachita is called the Black River. The Black River joins the Red River, which flows into the Atchafalaya River and the Mississippi River via the Old River Control Structure.

The Ouachita-Black Rivers Navigation Project stretches from central Arkansas to Jonesville, Louisiana, where the convergence of rivers forms the Black River. (www.mvk.usace.army.mil/lakes/ouachitablackriver/main)

Wetland and Habitat Protection and Restoration

Mississippi Alluvial Valley

Bayou Cocodrie National Wildlife Refuge
<http://bayoucocodrie.fws.gov>

Cat Island National Wildlife Refuge
<http://www.fws.gov/catisland/>

Ducks Unlimited Wetland Restoration Projects (coastal also)
http://southern.ducks.org/maps/LA_restoration_projects.jpg

Tensas National Wildlife Refuge
<http://www.fws.gov/tensasriver/>

Coastal/Deltaic Region (see Appendix)

Coastal Restoration Projects
<http://dnr.louisiana.gov/crm/coastres/projectlist.asp>

River Corridor and Wetland Restoration Projects (EPA)
<http://yosemite.epa.gov/water/restorat.nsf/Louisiana>

Caernarvon Freshwater Diversion Project
<http://www.lacoast.gov/programs/Caernarvon/factsheet.htm>

Davis Pond Freshwater Diversion
<http://www.mvn.usace.army.mil/pao/dpond/davispond.htm>

Delta National Wildlife Refuge
www.fws.gov/delta/

Resources: Partnerships, Programs, Reports, Research

Atchafalaya Basin Program
<http://dnr.louisiana.gov/sec/atchafalaya>

Barataria-Terrebonne National Estuary Program
www.btnep.org

Old River Control Structure Master Plan – U.S. Army Corps of Engineers
http://www.mvn.usace.army.mil/recreation/docs/OR_MasterPlan.pdf

“Nutrient Releases to the Mississippi River in the Louisiana Industrial Corridor: Voluntary Reductions in Nitrogenous and Phosphatic Compounds”, A.T. Knecht, University of New Orleans; Louisiana Environmental Leadership Program, Louisiana Department of Environmental Quality, Interagency Agreement No. 541321, 8/18/00.

Ouachita River Foundation
www.ouachitariver.org

USGS Studies and Reports

Atchafalaya and Mississippi river Deltas Study – Sediment-Hosted
Contaminants
<http://gulfsci.usgs.gov/missriv/reports/ofrshelf/index.html>

Appendix: Mississippi River Diversions/Reintroductions in Louisiana

Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA)

<http://www.lacoast.gov/projects/list.asp>

<u>Project</u>	<u>Status</u>
Benny's Bay Diversion	Uncertain
Caernarvon Diversion Outfall Management	Completed 2002
Delta-Building Diversion at Myrtle Grove	Engineering, Design
Delta-Building Diversion, Ft. St. Philip	Engineering, Design
Delta-Wide Crevasses	Completed 1999
Mississippi River Reintroduction into Northwest Barataria Basin	Engineering, Design
Myrtle Grove Siphon	Uncertain
Naomi Outfall Management	Completed 2002
River Reintroduction into Maurepas Swamp	Engineering, Design
Spanish Pass Diversion	Engineering, Design
Violet Siphon Diversion	Operating 1992, Revision Underway
West Bay Sediment Diversion	Completed 2003
West Point a la Hache Outfall Management	Engineering, Design
White Ditch Resurrection, Outfall Management	Engineering, Design

Louisiana Coastal Impact Assistance Plan (CIAP) – June 2007
<http://dnr.louisiana.gov/crm/ciap/Final.pdf>

Projects for Enhanced Management of Mississippi River Water
and Sediment

Violet Diversion
Blind River Freshwater Diversion
Bayou Lamoque Floodgate Removal
Mississippi River Delta Management Strategic Planning

Louisiana Coastal Area – Ecosystem Restoration Study (2004)
http://lca.gov/main_report.aspx

Near-term Critical Restoration Features

Small Diversion at Hope Canal
Small Bayou Lafourche [River] Reintroduction
Medium Diversion with dredging

¹ Action Plan for Reducing, Controlling, and Mitigating Hypoxia in the Northern Gulf of Mexico,
(www.epa.gov/msbasin/taskforce/actionplan/index.htm).

² The LMRSBC's Mission Statement, current activities, and meeting notes can be found at
www.epa.gov/gmpo/specialactivities.htm.)

³ <http://www.mvn.usace.army.mil/pao/bro/misstrib.htm>

⁴ Kleiss, et.al, *Water Quality in the Mississippi Embayment, Mississippi, Louisiana, Arkansas, Missouri, Tennessee, and Kentucky, 1995-98*, U.S. Geological Survey, USGS 2000, Circular 1208, <http://water.usgs.gov/pubs/circ/circ1208/>; <http://ms.water.usgs.gov/misenawqa/>.

⁵ Turner and Rabalais, "Suspended sediment, C, N, P, and Si yields from the Mississippi River Basin," *Hydrobiologia* 511, 2004.

⁶ Goolsby, et.al, *Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin*, White House Office of Science and Technology Policy Committee on Environment and Natural Resources, May 1999.

⁷ R.B. Alexander, et.al, "Supplementary Information for 'Effect of stream channel size on the delivery of nitrogen to the Gulf of Mexico,'" http://www.water.usgs.gov/nawqa/sparrow/nature/nature_supinfo.pdf.

⁸ Alexander, "Effects of stream channel size on the delivery of nitrogen to the Gulf of Mexico," *Nature*, vol.403, 17 Feb 2000, http://www.water.usgs.gov/nawqa/sparrow/nature/nature_alexetal-2.pdf.

⁹ *Reassessment of Point Source Nutrient Mass Loadings to the Mississippi River Basin*, Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, November 2006.

¹⁰ http://www.epa.gov/msbasin/taskforce/Point_Source_Mass>Loading.pdf;
<http://www.epa.gov/OWOW/msbasin/taskforce/protocol.htm>

¹¹ 2007 allocations for USDA Conservation Programs – FRPP, WRP, EQIP, WHIP, GRP, CSP- can be seen at www.nrcs.usda.gov/programs/2007_allocations/FY2007program_allocations_by_states.html.

¹² (www.LSUagcenter.com/web/2001-6.asp; www.epa.gov/gmpo/presentation/lower.pdf)

¹³ Several of these practices were highlighted at the symposium "Nutrient Loading and Removal in the Lower Mississippi River", New Orleans, June 1-3, 2006, (www.tetrattech-ffx.com/lower_miss/agenda.htm).

¹⁴ http://www.lsuagcenter.com/en/environment/conservation/master_farmer/

¹⁵ <http://cfpub.epa.gov/npdes/>; http://cfpub.epa.gov/npdes/home.cfm?program_id=6

¹⁶ Faulkner and Ulla, "Restoring Water Quality Functions in Riparian Forests of the Lower Mississippi Alluvial Valley," http://www.tetrattech-ffx.com/lower_miss/pdf/friday/faulkner.pdf.